

## THE MEANING OF CONSCIOUSNESS\*

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## INTRODUCTION

THE concept of consciousness as a faculty or as a well-defined entity is very old and traces back to metaphysicians of days gone by. The metaphysical notions, spun out of fantasy, concealed in complicated verbiage the more simple notion of the soul as formulated by the scholastics and localized by Descartes in the pineal gland. Consciousness was conceived as a sort of homunculus of the mind, as a special faculty, a psychic force which presided over thinking. Even so modern a philosopher as Herbert Spencer spoke of the seat of consciousness. As metaphysics waned, psychologists, both experimental and academic, began to study the elementary components of consciousness, such as ideas, images, perceptions, memories, concepts, judgments, etc., the raw materials, as it were, of conscious awareness. They made important contributions but deluded themselves into thinking that they no longer equated consciousness with soul; in effect they unconsciously rationalized the two by means of not very subtle semantics. In more recent years neurologists, neurophysiologists and neurosurgeons sought to elucidate consciousness by means of experiment and clinical observations, nearly all with special emphasis on the cerebral localization of consciousness. Implicit in most of those studies, no matter whether the conclusions were negative or positive, was the idea of consciousness as an entity which had a seat in the brain.

Many references, too numerous to mention, could be cited in support of this observation. A few will do. In 1938 Penfield<sup>1</sup> wrote on the cerebral cortex and consciousness. In 1944 Jefferson<sup>2</sup> discussed consciousness, unconsciousness and sleep. In 1946 Dandy<sup>3</sup> located consciousness in the corpus striatum, an idea recently demolished by Russell Meyers.<sup>4</sup> The diencephalon,<sup>5</sup> that very important and very obscure region of the

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brain, has now become the royal seat of consciousness. Penfield and Jasper<sup>6</sup> reverted to the problem in their discussion of epilepsy. Thompson and Nielsen<sup>7</sup> spoke of areas essential to consciousness. Other regions, too, were not neglected: the frontal lobes,<sup>8</sup> the third ventricle, the medulla and the cerebellum.<sup>9</sup> Even Russell Brain<sup>10</sup> who, in a recent very profound analysis of the cerebral basis of consciousness, pointed out the numerous fallacies involved in the attempt to localize consciousness, greatly weakened his conclusions by stating that, "As neurologists we should not be surprised that consciousness is most closely linked with those basal ganglia which made their appearance in the course of evolution millions of years before thought became possible."

As a corollary to the concept of consciousness, a whole philosophy and psychology of unconsciousness has come into being; unconsciousness, that is, as an entity, as a positive state, capable, so to speak, of existing by itself, of acting and being acted upon. Schopenhauer, Nietzsche and von Hartman, later expounded by Bergson, spoke in learned philosophical manner of unconsciousness as a special force. Freud, as is well-known, postulated an active, motivating unconscious capable of leading its own existence. Numerous psychologists, among them Ribot and Janet, regarded unawareness as a subconscious state, also conceived of as an independent entity. In this country Morton Prince introduced the concept of a coconscious which to him better expressed the state of unconsciousness.

It is important to emphasize, even at the risk of reiteration, that the state of unconsciousness is regarded as a positive force. Now, it is quite clear from a neurophysiological point of view and from all that is known of cerebral function, that the notion or the idea of unconsciousness as something positive is wholly untenable. Other writers have pointed out that unconsciousness is a negative state, that is, it is the absence of consciousness. As a *façon de parler* one may use hypothetical postulates, but to say that a negative state can and does act is to anthropomorphize an idea and by some mental jugglery turn it into a positive force capable of its own existence and of becoming physiologically operative. Shades of Hughlings Jackson!

It is the object of this paper to defend the point of view that consciousness is not an entity by itself, that there is no single state of consciousness but that there are innumerable varieties, fragments or states of consciousness, that since it is a general cerebral function it is fruitless

to attempt to localize it, and that consciousness is a relative term expressive of a series of relations. From which it follows that unconsciousness, being the absence of consciousness, is a negative state and that there are degrees of impairment or loss of consciousness, that the concept of unconsciousness also is a relative one, and therefore there are various states of unconsciousness. Before proceeding with further discussion and adducing clinical neurological and neurophysiological evidence, may I quote two sentences and a whole paragraph from a paper which I wrote, under a rather youthfully presumptuous title, in 1917, that is, thirty-four years ago:<sup>11</sup>

"In the minds of many there still lurks the metaphysical religious notion of soul or something extraneous which acts as a sort of subjective correlator of psychic functions.

". . . there is no (faculty of) memory but (there are) memories, no judgment but judgments, no intellect but intelligences, no will but wills, *no consciousness but states of consciousness*.

"Consciousness is a growth; it is the result of the upbuilding of the various elemental functions of the mind into complex, coordinated manifestations. It is not a thing by itself added on to psychic functions but is called into being by the completion of a psychic process which can exist for itself. Before there can be awareness to any mental process there must be an emotional tone, however faint, added to it, which is capable of bringing it to a focus. But the possibility of the mental process becoming conscious is inherent in the very process itself. The construction of a building furnishes an illustration. To build a structure one needs bricks, iron, steel, wood, mortar, tin, glass, stone, copper, paint, etc. Taken separately, incoordinated (unintegrated), they are a mere heap of different substances; but as the steel, bricks, stones, etc. are put together we see by slow growth the building taking shape. Finally a complete structure rises out of the heap. Now, there is nothing in the building which was not before in the heap, and yet we have a completed structure in the one and confusion in the other. So with consciousness. The various ideas, sensations, perceptions, images, memories, etc. are the different substances which can only become conscious when they are built, organized (integrated) into structures. But a plan is needed to evolve a building out of its component parts; even so is it with the elemental psychic processes. Herein, however, lies the difference between the two. Where in the inanimate structure arrangement is needed out of disorder,

in the mind, the inherent tendency to directed growth of all the elements, the conative tendency of all mental processes, the innate tendency of any psychic manifestation to adopt a feeling tone, all combine to build a conscious structure. Not only that, but the organic evolutionary tendency to growth from the simple to the complex, which is transmitted (by heredity), furnishes practically complete the ability of evolving psychic structures out of the elementary psychic processes. The plan is inherent in the protoplasm. In short, consciousness is nothing but the completed (integrated) structure of any psychic process."

With few changes in words to conform to modern terminology I believe the statement holds true today as it did in 1917. You will perceive in the paragraph just quoted the theory of evolution as put forth by Herbert Spencer, the concept of levels enunciated by Hughlings Jackson and the theory of the integrative action of the nervous system so brilliantly promulgated by Sir Charles Sherrington. Unfortunately the fundamental concepts of these two giants in neurology and neurophysiology are being neglected. And so I would refer to Walshe's profound critique of the interpretation of experimental studies of cortical functions, which appeared recently.<sup>12</sup>

#### NEUROLOGICAL CONSIDERATION OF CONSCIOUSNESS

From a neurophysiologic and neurologic point of view it will serve no relevant purpose to enter here into the psychology of consciousness, very important though that is. We may define consciousness as a state of awareness, an ability to attend to internal and external stimuli and a capacity to react or not react as circumstances demand. Obviously all sorts of psychologic processes enter into various states of consciousness, from the simplest to the most complex: ideas, sensations, memories, concepts of time and space, of body image, and internal and environmental relationships. Intelligence, too, enters into consciousness, and though the two are not quite the same, both are general functions of the whole brain including the autonomic nervous system. David Wechsler<sup>13</sup> has defined intelligence as "the aggregate or global capacity of the individual to think rationally, to act purposefully and to deal effectively with his environment." With some modification this definition could almost serve for consciousness. Consciousness, however, is both more and less than intelligence, as intelligence is both more and less than consciousness. One may be partly intelligent and partly conscious or wholly

conscious and only partly intelligent. The point is there are so many varieties or states of consciousness that it becomes impossible to think of it neurologically as a single entity. There is a generic consciousness and there are specific types or states of consciousness, just as with intelligence. An example of the futility of looking upon either as a faculty or totality is the perennial question whether a dog is intelligent. It depends, of course, what is implied in the question. Is a dog intelligent? The answer is yes. He definitely has a certain type of intelligence. Is a dog as intelligent as man? The answer is no. Is a dog conscious? Certainly. How conscious, how aware, how introspective, we do not know because he does not talk.

The difficulty of defining consciousness in neurologic terms as a cerebral function and to try to localize it anatomically or neurophysiologically derives from the fact that practically all the studies made and all conclusions drawn deal with impairment or loss of consciousness. Accidental or experimentally purposeful injury to practically every part of the brain can result in impairment of consciousness: any part of the cortex and subcortex, the thalamus, the basal ganglia, the interbrain, the brain stem and even the cerebellum. Pressure on the medulla, third ventricle lesions, or general circulatory disturbance either of the cerebral blood flow or of the cerebrospinal fluid can bring about impairment. There need be no obvious injury or disturbance to bring about impairment or loss of consciousness, for example, extremely minor degrees of concussion, syncope from loss of blood, from a blow to the pit of the stomach, from shock or fear. Interference with the flow of blood from any cerebral artery, whether it be the carotid, anterior, middle or posterior cerebral, or the basilar artery can bring it about. Drugs, such as morphine, the barbiturates, alcohol, cannabis indica can impair consciousness. Hypoglycemia can do it. Simple emotional depressions and manic states as well as other intense emotional disturbances restrict or impair consciousness. The point is that in every state of consciousness, wherein the individual is well aware and functions adequately, there can and may be present various degrees of impairment of awareness, just as in many states of impairment of consciousness there can be varying degrees of preservation of consciousness.

In their studies on anosognosia and patterns of disorientation in organic brain disease, Weinstein and Kahn<sup>14, 15</sup> have shown how patients, who on superficial examination appear to be fully conscious and to be-

have normally, on closer investigation are found to be profoundly disturbed in their relation to environment and to be unaware that they are ill. They may have no awareness of obvious paralyses or of the fact that they have been operated upon. They may not be adequately oriented as to time, place or person and they may show partial or complete denial of illness. Altered or impaired states of consciousness can give rise to different types of thinking, and impairment at different levels may express itself in characteristic clinical syndromes. For example, in a given patient a mild degree of impairment of consciousness may result in a depression, a greater degree of impairment in a paranoid reaction, and a still greater one in a manic state. A fact worthy of note is that a strictly limited unilateral lesion does not affect general consciousness whereas bilateral lesions may.

In his experiments with double simultaneous stimulation, M. B. Bender<sup>16</sup> found that a person with an as yet unrecognizable unilateral brain lesion, who perceives individual stimuli on both sides of the body, if made separately, will feel only one stimulus on the healthy side even though both sides have been simultaneously stimulated. That is, there has been extinction of one stimulus by another, so that the individual has become unaware, though otherwise fully conscious, of the fact that he has received two stimuli at the same time. One of my patients got up in the middle of the night to go to the toilet, struck his forehead against the bathroom door, fell backward striking the back of his head, picked himself up, walked into the bathroom, then returned to bed and to sleep. On arising he went to work and found that he had lost his sense of depth. Being a cabinet maker who could tell minimal differences even of one and two millimeter thicknesses he now had to measure the length of a five and ten centimeter object before he could tell the difference. His consciousness, which was otherwise intact, was impaired only to the extent of loss of awareness of depth.

Another difficulty which derives from our present inability to speak of psychologic processes in neurophysiologic and neuroanatomic terms, is the way in which the word unconsciousness is used without precise definition or qualification. A person obviously is not conscious when he sleeps and when he is in coma, but the difference between the two states is enormous. A person asleep can be awakened, one in coma cannot; reflexes can be elicited in sleep, they are absent in complete coma; thought processes such as dreams can occur during sleep, none occur

in coma. But even comas, as every clinician knows, differ in depth, that is, the degree or extent of impairment of consciousness. During the hypnotic state, when an individual appears to be fully conscious, it can be shown that consciousness is impaired. A person may be aware that he is unaware or he may not.

One can demonstrate impairment of consciousness by means of the electroencephalogram in barely perceptible petit mal states. Minor and almost imperceptible paraphasias restrict consciousness or awareness of language. The process of learning can be carried on, as animal experiments have shown, after decortication when presumably thought processes and states of consciousness are impaired.

The error in all attempts to study neurophysiologically or neuropathologically impairment of consciousness, linguistically called unconsciousness, lies in this, again invoking Hughlings Jackson, that negative states vouchsafe no insight into the nature of positive cerebral activity and that no valid conclusions can be drawn from isolated absence of function. Even direct stimulation experiments, which either initiate neural discharges or abolish them, do not throw light on the nature of consciousness or its impairment. And if the contention is correct that consciousness is a function of the whole brain no lesion anywhere can be its seat. As a corollary it follows that loss of consciousness also is not localizable. Therefore to search for a center of consciousness is to chase a will o' the wisp.

It is true that injury to certain regions of the brain, the diencephalon, for instance, will result in serious impairment of consciousness but this merely points to two facts. First, that quantity can alter quality and, second, that there are regions where integration is more extensive and more complex than in others. By quantity altering quality is meant suddenness, intensity and extent. The comparison between a fillip on the nose and a sledge hammer blow to the head will serve as a simple illustration. Both are blows, but with this difference, the one may pass unnoticed, the other may cause death. As to regions, and by that is not meant centers, there obviously are levels of integration which become more and more complex as one ascends in the hierarchy of the nervous system. There may be more shunting of impulses in one region than in another or, to use another analogy, one fuse may control more wires than another; but there is no single brain fuse box and no one master key to open it or to shut it. Certainly for general cerebral activ-

ity and especially for consciousness there are no special centers. It has long become apparent that the jig-saw puzzle geographic areas of Brodmann and the Vogts have no particular relation to neurophysiologic reality and the complicated charts of aphasia have no more validity than other fanciful schemata.

### CONCLUSIONS

1. Consciousness is not a faculty or single entity but consists of a series of states of consciousness. It is the result of numerous integrations of simple and complex neural activities underlying mental processes. Consciousness is a relative concept expressive of a series of relationships. It is an attribute of integration, a function of the whole brain including the autonomic nervous system.

2. Unconsciousness is a negative state. It ranges all the way from minor impairment to complete loss of consciousness; that is, there are many states of negative consciousness. As a psychologic concept the term unconsciousness is serviceable; as a neurophysiologic or neuro-anatomic entity it has no validity.

3. Being a general function of the brain there is no one seat of consciousness. Therefore one cannot localize consciousness or states of consciousness. There are regions of lesser and greater integration, impairment of which will restrict or abolish consciousness.

4. Experimental or fortuitous impairment of consciousness, resulting as it does in negative states, at present contributes little to the elucidation of the ultimate nature of consciousness.

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